CHAPTER 8

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8.00 Introduction

It is Caltrans policy to conduct its business in the safest possible manner consistent with applicable law, rule or policy.

This chapter of the Caltrans Maintenance Manual is a part of the Caltrans written injury and illness prevention program. It provides detailed instructions for Maintenance managers, supervisors and employees. It is designed to help employees in their efforts to work safely. All employees are expected to follow these minimum guidelines.

Other employee safety subjects are covered in the Maintenance Code of Safe Operating Practices, other chapters of this manual, and in the Departmental Safety Manual.

An important factor to be considered in employee safety is the false sense of security acquired when workers have not had a recent close call. It is also the hardest to protect ourselves, against. On rural routes, we may have only 100 vehicles pass per day. In a metropolitan District, we may have more than 333,000 vehicles pass each day within a few inches or feet of our work sites. In 1996, the California Highway Patrol arrested 91,988 motorists for Driving Under the Influence (DUI). In fact, eight of the last twelve highway workers killed on the job were struck by motorists that were DUI.

The most important part of our job is to protect ourselves from traffic, while getting our work done. We do this by:

(A) Letting the motorist know what's going on and where to drive.

For this we use signs, flags, barricades, cones, flashing amber lights, changeable message signs (CMS) and flashing arrow signs (FAS).

(B) Avoiding the errant driver.

Face traffic, stay aware through your own eyes and ears or those of a lookout who will warn you. Plan your escape route.

(C) Using protective equipment.

Protective vehicles, truck mounted crash cushion headrests and seat belts/shoulder harnesses.

(D) Planning the work to reduce employee exposure to traffic.

8.01 Managers and Supervisors Responsibilities

The following paragraphs summarize the basic elements of the Caltrans injury and illness and prevention program and define who is responsible for enforcing the safety and health policies and practices. For further information consult Chapter 1, the Caltrans Injury and Illness Prevention Program, in the Departmental Safety Manual.

(A) Supervisors and managers are the responsible persons to implement, maintain, and enforce Departmental safety rules and policies.

(B) Supervisors, in cooperation with training personnel, shall develop safety related training programs to ensure all employees receive:

(1) General training to cover hazards basic to all places of employment.

(2) Specific training to cover hazards that are unique to each employees' job assignment.

(C) Supervisors shall ensure that each employee is able to understand how to complete each assigned task safely.

(D) Supervisors shall ensure that each employee follows safe and healthy work practices and procedures.

(E) Supervisors shall keep abreast of safety and health regulations affecting the operations they supervise.

(F) Supervisors shall advise management of safety training needs of subordinates.

(G) Supervisors shall ensure that each employee is provided with the equipment, necessary to complete assigned tasks safely.

8.02 Work Site Safety

Caltrans commits to promoting an effective injury and illness prevention program. Managers and supervisors are responsible to:

(A) Routinely inspect all field and facility work areas under their jurisdiction to identify, document, and eliminate physical or environmental hazards that may contribute to injuries or illnesses. In order to accomplish this, Region Managers should do three or more safety reviews per month and Area Superintendents should do three or more field or facility safety reviews per week.

(B) Routinely review, study, and document all operating methods, practices, and procedures to reduce or eliminate the potential for injury or illness.

(C) Counsel, train, and discipline employees when appropriate to reduce human factors that contribute to injuries or illnesses.

(D) Investigate every injury or illness and vehicle accident to:

(1) Determine contributing circumstances, and

(2) Develop information that leads to correcting unsafe conditions and unsafe acts.

(E) Establish and maintain codes of safe operating practices, or equivalent, which identify hazards specific to job assignments.

(F) Enforce all rules, laws, and policies that will promote, protect, and preserve employee safety and health.

8.03 Individual Responsibilities

All employees shall do everything reasonably necessary to protect their own safety and health and that of others, by complying with all occupational safety and health policies, procedures, laws, rules, or regulations. They shall report all injuries, illnesses, or unsafe conditions to their supervisor at once, or before the end of the work shift.

All employees are expected to report to work mentally and physically capable of performing all of their assigned duties without jeopardizing the safety and health of themselves, other employees, or the public. They shall be free from the effects of medication, controlled substances, alcohol, or the complications arising from illness or injury, which might impair their judgment and/or ability to perform their work.

Employees are responsible to notify their supervisor of any personal medical condition or prescribed medication, which might impair their ability to perform their assigned duties. Employees should also report to their supervisor any behavior by an employee, which reasonably indicates that they are not fit for duty.

Supervisors or managers who observe an employee that appears to be unable to perform his/her assigned duties and have a concern about the safety of the employee or others, are responsible to prohibit that employee from continuing to work. The employee should be prohibited from working until a determination of the reason for the employees behavior is made, or until a medical evaluation of the employees fitness can be completed.

Any employee who violates any safety and health policy, procedure, regulation, law, or rule may be disciplined in accordance with the provisions described in the Caltrans Guide to Employee Conduct and Discipline.

Any supervisor or manager who fails to enforce safety and health policies, procedures, regulations, laws, or rules shall be disciplined in accordance with the provisions described in the Caltrans Guide to Employee Conduct and Discipline.

Supervisors and managers shall ensure that employee safety and health issues are discussed and assessed with employees at least annually at the time of issuing an Individual Development Plan/Performance and Appraisal Summary, and/or at the time supervisors discuss employee probationary reports.

Supervisors in office work settings should include discussions about health and safety matters at routinely scheduled staff meetings, but, at a minimum, shall have meetings with their employees at least quarterly to discuss safety and health issues.

Supervisors in field locations shall have tailgate safety meetings, at least every 10 working days in compliance with the requirements of the Construction Safety Orders, ß1509(e).

Supervisors shall also conduct meetings with employees when they are first hired, or when a new process, chemical, or procedure is introduced that contains a new or previously unrecognized hazard or when a new or previously unrecognized hazard is identified.

8.04 Responsible Person In Charge

It is practice and policy that whenever two or more employees are assigned to work together, one of the employees shall be placed in charge.

This responsibility is usually assigned to the designated supervisor or lead-worker based upon his/her civil service classification. However, there may be occasions when these individuals are unavailable to direct the work for given periods of time, or where emergencies arise that require non-supervisory employees to direct the work of others.

Supervisors must always designate an individual to be in charge during any planned absence, and identify the steps to be taken in the event of an emergency.

8.05 Changing Chapter Standards

Chapter 8 requirements are intended for the usual situations. Unusual circumstances may call for greater or lesser protective measures than are described here as standard. It is not possible, or even desirable, that a manual such as this contain detailed rules for every possible situation. It is up to the supervisor to exercise judgment in applying these measures. Supervisors should not, through the use of protective devices, create greater hazard to their crews by increasing the severity and/or duration of exposure.

Deviations from standard measures may be judged desirable by the supervisor for a variety of reasons such as sight distance, proximity of ramps or street intersection, restrictive width, short duration of job at one location, or minimal exposure because of volume, speed, and proximity of traffic. Decisions to reduce standard measures must have the written approval of someone responsible for the work at the Area Superintendent level or higher. This authority may be delegated to the Supervisor at the Districts discretion. This written approval shall describe the deviation and list the reasons it is needed. It shall be kept on file in the regional office for three years. This written approval is not needed in situations, which develop suddenly and unexpectedly and demand immediate action to prevent injury or harm to workers or the traveling public. Operations should be brought up to standard as soon as resources become available. The supervisor may increase worker protection using standard devices without approval.

The standard lane closure plans, Standard Plan T10 through T17, are for normal work zones and conditions. In unusual situations, the Maintenance Engineer may request the District Traffic Engineer to authorize a deviation at a specific location, providing:

(A) The specific location is identified by County, Route and Post mile.

(B) The deviation does not compromise the safety of workers.

(C) The deviation is not for general use throughout the District.

(D) The deviation and rationale are documented in District files.

The intent is to allow deviation at specific locations without creating individual District wide standard plans. A deviation could be allowed for an indefinite time at a specific location, if the special conditions remain unchanged.

8.06 Personal Protective Equipment

Caltrans provides the personal protective equipment (PPE) employees will need to work safely. This equipment is for worker protection and they shall use it properly to prevent injuries.

Personal protective equipment consists of many items. Hard hats, orange shirts, safety vests, safety glasses, earplugs or muffs, gloves, goggles, respirators, rain gear, and foot protectors are some examples.

The supervisor should select and provide the proper equipment and ensure workers wear it.

Refer to Appendix C of the Code of Safe Operating Practices and Chapter 12 of the Departmental Safety Manual for more information about personal protective equipment. Refer to Chapter 15 of the Departmental Safety Manual for a guide to using respiratory protection.

8.07 Emergency First Aid

All maintenance employees should be trained in Standard First Aid during the first three months of their assignment, and at least once every 3 years thereafter. All Tree Maintenance Workers and related classifications and all Electrical Workers and related classifications shall be trained in Cardio Pulmonary Resuscitation (CPR) during the first month of their assignment and then at least once a year thereafter. The training must be certified by the American Red Cross or other accredited organization.

An approved first aid kit must be available at each work site. First aid kits and supplies shall be kept in sanitary and usable condition and inspected at least monthly. The Departmental Safety Manual, Section 9.09 and 9.10, specifies size, location, and quantity of supplies for various categories of first aid kits.

For more information on first aid and emergency medical care see Chapter 9 of the Departmental Safety Manual.

8.08 Medical Treatment

Supervisors are responsible to ensure that if an injured or ill employee needs medical attention he/she will be taken to the nearest approved medical clinic, or hospital emergency room for treatment. Supervisors shall post the name and location of each approved medical service provider in a conspicuous place at each Caltrans work site. At a minimum, they shall be posted on designated bulletin boards in hallways or individual offices, and other appropriate locations, such as motor vehicles, that will ensure every employee is aware of the locations.

If the injury is serious an ambulance should be called.

A supervisor or designee shall always accompany the injured or ill employee to the medical facility.

As conditions warrant, the supervisor should talk with the attending physician to determine the extent of the injuries, the affected employee's recovery period and ability to return to work, and the employees ability to perform the full range of duties upon release.

The supervisor must describe to the doctor what modified duty is available so that the employee can return to work as soon as possible.

Employees shall report any work-related injury to their supervisor, immediately, or at least before the end of the work shift. They shall also report the injury to the supervisor before going to a doctor.

For more information on personal injury accidents and illnesses see Chapter 9 of the Departmental Safety Manual

8.09 Transportation of Workers

Workers shall be transported in vehicles equipped with seats and seat belts. Workers shall not be allowed to ride in the beds of dump trucks, buckets of loaders, or any other place on a vehicle that was not designed for driving or riding.

8.10 Relation of Chapter 8 to Chapter 7

Chapter 7 of this manual contains the separately published booklet, Manual of Traffic Controls (MTC), 1996 (Revision 1). The MTC is produced by the Traffic Operations Program. In case of any inconsistency between the MTC and Chapter 8 of the Maintenance Manual, Maintenance forces are to follow Chapter 8.

8.11 Definitions

Arrowboard	Refer to "Flashing Arrow Sign" or "FAS". The terms "arrowboard" and "flashing arrow sign" are synonymous.
Flashing Amber Light	This term includes such devices as flashing lights and rotating beacons.

Flashing Arrow Sign (FAS)	The Type I is an 8 feet x 4 feet (2400 mm x 1200 mm), trailer mounted FAS. The Type II is a 6' x 3' (1800 mm x 900 mm), vehicle mounted FAS. FASs have several modes. The caution mode has four lights flashing and the arrow modes flash right or left. See Section 8.21, The Use of the Flashing Arrow Sign.
Moving Operations	A moving operation is any work activity that moves along the traveled way slower than the prevailing speed of traffic. Some examples are striping, sweeping, etc.
Short Term Operation	A short-term operation is any work activity that can be performed in 10 minutes or less during light traffic volumes, without interfering with traffic or placing the employee in jeopardy. Some examples are pavement patching, removing a large piece of debris, etc.
Stationary Operation	A stationary operation is any work activity that includes workers on foot or equipment occupying any part of a paved shoulder or the traveled way at one location for more then 10 minutes. See exception noted in Section 8.28 (D) Moving Shoulder Operations.
Supervisor	The term supervisor as used here refers to any individual who has direction or control over another employee; however for approval of deviations, a supervisor is defined as one who is classified as a supervisor by his/her civil service classification.
Traveled Way	The traveled way describes that portion of the roadway where vehicles normally drive. This includes traffic lanes, turning lanes, and ramps. It does not include paved or unpaved shoulders or medians.
Truck Mounted Crash Cushion	The terms truck mounted attenuator (TMA) and truck mounted crash cushions (TMCC) are synonymous. The TMCC is designed to absorb kinetic energy. The TMCC softens the blow to our driver and usually reduces the impact to the motorist. While the TMCC on the truck reduces accident severity, it does not reduce the distance a vehicle will roll ahead when hit from behind.

8.12 Protective Vehicles

There are three classes of protective vehicles: Shadow, Barrier, and Advance Warning. All shadow vehicles and barrier trucks shall display a standard pattern of orange and white diagonal reflective striping on the back of the vehicle and/or the truck mounted crash cushion.

(A) Shadow Vehicle

A shadow vehicle is used to protect the work vehicle in a moving operation. A shadow vehicle shall:

(1) Have a truck mounted crash cushion (TMCC).

(2) Carry a FAS operating in the arrow mode while occupying a lane on multilane roads.

(3) On two lane roads, carry either a FAS operating in the caution mode or a flashing amber light.

(4) Be equipped with headrests.

(5) Be equipped with seat belt and shoulder harness.

(6) Be equipped with a two-way radio.

The shadow vehicle headrest protects the drivers' head and neck. The seat belt and shoulder harness prevent the driver from being thrown forward. Normally, the shadow vehicle shall be occupied by the driver only. However if a passenger must occupy the vehicle while it is shadowing, the passenger seat shall also be equipped with headrests and a seat belt and shoulder harness.

The purpose of a shadow vehicle is to provide physical protection for crews and their vehicles. The mass of the vehicle is the most important factor in protecting the driver of the shadow vehicle, the crews and the vehicles. The heavier the shadow vehicle, the better the protection, that is provided. A shadow vehicle shall have a Gross Vehicle Weight (GVW) greater than 19,800 pounds (9000 kilograms).

The shadow vehicle shall be positioned upstream from the work vehicle between approaching traffic and the vehicle it is protecting. It should be positioned where it will provide the best protection; not too close, or not too far back. It must be close enough to intercept errant vehicles, but far enough back to not roll ahead into the work vehicle. The shadow vehicle should remain approximately three seconds behind the work vehicle.

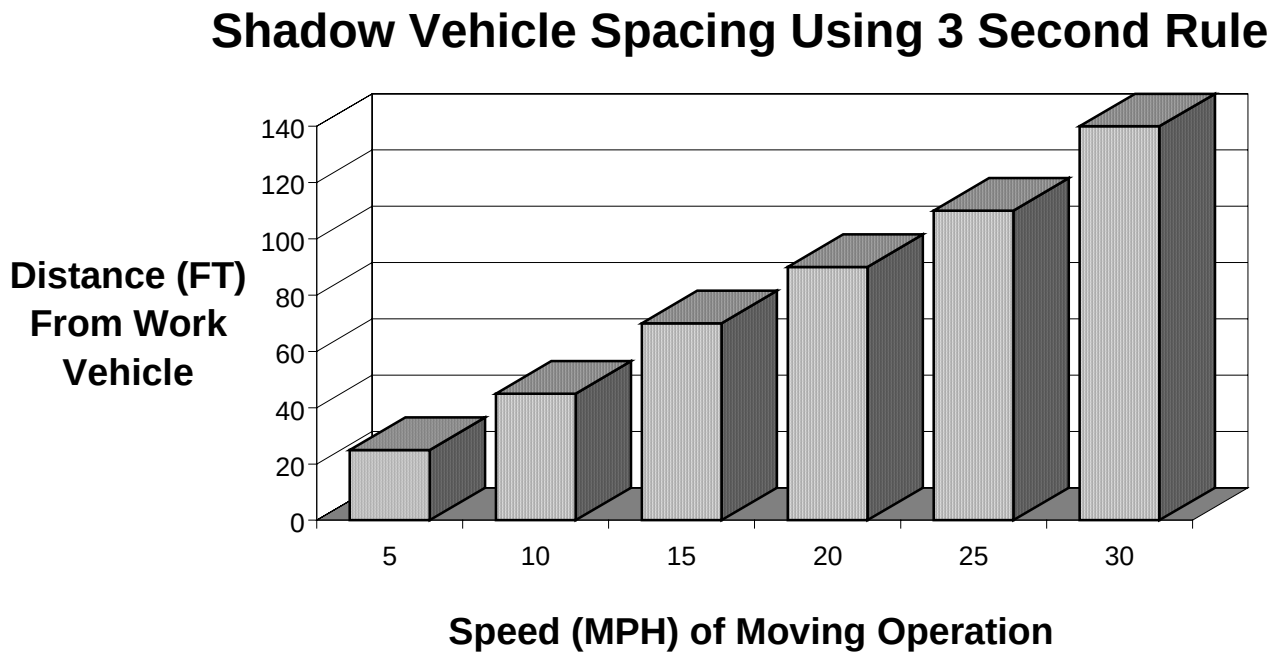


Figure 8-1: Shadow Vehicle Spacing

(B) Barrier Vehicle:

A barrier vehicle is an unoccupied vehicle or piece of equipment used to protect workers from errant motorists. Any vehicle at a work site can be used as a barrier because there is no minimum barrier vehicle size. However, workers shall use the heaviest vehicle reasonably available. In certain instances, more than one barrier vehicle may be needed. A barrier vehicle does not require a TMCC. However, if a TMCC is available, it should be used.

Any vehicle that is used should be parked upstream from the work site between approaching traffic and the workers. It should be parked where it will provide the best protection; not too close to the workers, not too far back. It shall be carefully positioned so that it will intercept errant vehicles, but will not roll ahead into the work area. Roll ahead may be controlled by proper brakes, sufficient space, angle parking and the transmission in gear or in park.

A barrier vehicle without a TMCC can be parked a number of ways. It can be parked at an angle or even straight across the lane. If it is parked at an angle, the front of the vehicle should be pointed away from traffic. The wheels shall be turned away from the work zone and away from traffic. This will avoid motorist panic and prevent secondary collisions if the barrier vehicle is hit and pushed ahead. A barrier vehicle with a TMCC should only be parked parallel with the direction of traffic.

(C) Advance Warning Vehicle:

An advance warning vehicle is driven or placed upstream from a work zone (refer to the Moving Lane Closure Plans T15, T16 or T17). It advises the approaching motorists of what conditions to expect ahead.

On the shoulder of a two-lane highway, it shall display either a FAS in the caution mode, or a flashing amber light/rotating light. On the shoulder of a multilane highway, a FAS with the "Flashing Arrow" displayed shall be used if the work vehicle is on the traveled way. A changeable message sign may be used instead, of a FAS.

If the vehicle encroaches into the traveled way, it shall be equipped as a shadow vehicle. If it encroaches into a freeway lane, the vehicle shall display a FAS in the arrow mode. If it encroaches into a two-way conventional highway, the FAS shall be in the caution mode or display a flashing or rotating amber light.

8.13 Planning Work To Reduce Worker Exposure

Managers and/or Supervisors shall plan work to minimize the amount of time employees are exposed to moving traffic. This can be done, by choosing proper work methods, combining operations, avoiding high traffic volume periods, and reducing the threat from non-attentive, speeding drivers.

Work methods and procedures should be designed to keep the amount of time workers are exposed to moving traffic to a minimum. For example, crews should be instructed to assemble in safe areas well away from the traveled way, convoy to the work site, and do their work expeditiously. Once work is completed, they should return immediately to a safe area.

In addition, when employees reach the work site, the work method should be designed to minimize the amount of time, workers spend on foot near moving traffic. The first choice should be to use mobile, power equipment to do the work. A worker in a piece of equipment is generally much safer than a worker on foot. The next choice of work methods would be to provide workers on foot with physical protection. For example, a barrier vehicle, guardrail, or some other obstacle can be used to provide physical protection. The last choice is to have workers on foot without physical protection.

In this situation, the work method should be designed so that workers can face traffic whenever possible and can work apart as individuals and not in groups, close together. If none of the above methods are possible, it may be necessary to have lookouts or a lookout alarm device or both. See Warning Systems - Lookouts, Section 8.16.

When a lane closure is planned, especially on freeways, managers and supervisors should contact all crews who could work within the closure. With more crews involved, more work can be accomplished. For example, along with roadway repair, stencil work, guardrail repair, electrical work, sign work, shoulder repair, sweeping, and landscaping can be completed. Not only will more work be completed, but more protective vehicles may be available at the work site, providing workers with increased protection. In addition to maintenance operations, managers should coordinate with District Traffic Operations, Surveys and other District units for work needs within the closed lane. This approach will reduce employee exposure to traffic. It will also reduce the number of lane closures required for routine maintenance.

When planning combined operations, managers and supervisors shall also plan the work so that each employee has enough space to work safely. They shall consult Crowding of Workers, Section 8.17.

Another opportunity to reduce worker exposure to moving traffic is to carefully plan work on the highway. When there are fewer vehicles on the traveled way, there are fewer vehicles with an opportunity to hit workers. Managers and supervisors should consider reducing employee exposure by requiring an unconventional workweek or extended and/or multiple work shifts to take advantage of these lower traffic volumes. Managers should also review maintenance projects for opportunities to improve worker safety with a complete facility closure.

Before short-term tasks are assigned, the supervisor will determine if the task has to be done immediately, or if it could wait. He/she shall decide if it could wait until formal traffic control will be set up and the job performed as a part of a combined operation. An example would be the removal of litter from a center median area. If the debris is not a safety hazard, could picking it up wait until a lane closure is set for another reason?

Supervisors shall plan all work methods to minimize the need for the backing of equipment and vehicles at the work site.

8.14 Working Near Moving Traffic

When working on or near the traveled way for any amount of time, workers must be aware of the hazards from errant vehicles. If available, a vehicle, regardless of its size, shall be used as physical protection from traffic. Workers on foot shall face traffic whenever possible. If two or more persons are working close together, a lookout may be necessary (consult Warning Systems - Lookouts, Section 8.16).

Employees should work quickly, but safely, and return to their vehicle as soon as work is completed.

When working on the outside radius of curves, workers should be aware that some vehicles, may have the tendency to drift to the outside.

Traffic on two lane conventional highways is often lighter than on freeways. Workers cannot let this fact lull them into a false sense of security.

When working on conventional two lane roads, employees shall be aware that errant vehicles can come into the work area from either direction. Many two-lane operations involve short-term work such as fixing guide markers, straightening signs, and litter removal. These operations involve workers on foot, often next to the traveled way. When employees are working by themselves, they must make sure that they use their eyes and ears to look and listen for danger signals to ensure their personal safety.

It is recommended that employees who need to be highly visible during the day should wear white coveralls and the proper warning garments as described in the Departmental Safety Manual, Chapter 12, Section 12.20, to increase their contrast with orange equipment.

8.15 Facing Traffic (Employees on Foot)

The Supervisor shall plan and supervise the work to minimize the amount of time workers will have their backs to traffic.

Unless there is a clear reason for doing otherwise, employees shall continually face oncoming traffic while working on or near the traveled way. This is the personal responsibility of every worker.

Facing traffic is the most important thing workers can do to protect themselves and their coworkers while working on or near the traveled way. Facing traffic gives workers a better opportunity to see and hear errant vehicles. This allows them a chance to move out of the way and warn fellow workers.

8.16 Warning Systems-Lookouts

While working on foot on or near the traveled way, workers should normally be protected by barrier vehicles, guardrail, or other physical means. Where the absence of such physical protection exposes workers on foot to errant vehicles, a person shall be assigned as a lookout according to circumstances described below.

A lookout shall be assigned if all of these conditions exist:

(A) Work occurs on a roadway with a posted speed limit of 55-mph (88 kph) or more.

(B) Workers are without physical protection.

(C) Two or more people working close to each other.

(D) Working within 30 feet (9 meters) of moving traffic.

(E) A person is on foot.

The lookout shall continually watch approaching traffic for errant vehicles that may hit workers on foot. If trouble is suspected, the lookout shall warn the workers by yelling, using a vehicle or warning horn, a portable lookout alarm device or any system capable of communicating the warning message. This warning is intended to give workers the time to use a planned escape route to avoid the errant vehicle.

A lookout shall not be assigned any other duties.

Lookouts shall be rotated often enough to keep them alert.

The supervisor may use a crew lookout whenever he or she thinks it is needed. Even if workers are physically protected, using a lookout may be beneficial.

Electrical and mechanical detection systems may be used to supplement the human lookout.

Slope watchers shall be used when working under unstable slopes where rocks may fall and injure workers. These slope watchers shall not be assigned to watch the slope and to lookout for traffic at the same time. Refer to the Maintenance Code of Safe Operating Practices, Slope and Embankment Maintenance, and Appendix D, Cut Slope Safety and the Departmental Safety Manual, Chapter 21, Cut Slope Safety.

8.17 Crowding of Workers

Supervisors shall plan work so that each employee has adequate space to work safely.

Supervisors shall ensure that employees know their responsibilities for positioning themselves so that each employee has enough work space to work safely and avoid being struck by flying material or another worker's tools.

Workers shall avoid unnecessary gatherings, which increase accident exposure and cause public

concern.

8.18 Access to Median Work Zones

(A) Workers should not walk across traffic lanes to work in median areas. They shall drive into the median area and park when possible. However, the width and condition of the median must be considered. If the area is too narrow, wet, sandy or is difficult to accelerate from, it should be avoided.

(B) If it is not possible to park in the median area and crossing on foot is necessary, the following rules must be followed:

(1) Workers shall not run. They shall wait for a break in traffic adequate to allow them to walk across the lanes.

(2) Workers shall not carry tools or items that would slow them down and make the crossing unsafe.

(3) If the traffic is too heavy and a traffic break is not available, workers shall wait for a safer time to do the job. If they must cross, they shall call for traffic control or ask for a CHP traffic break.

8.19 Picking Up Litter and Debris

Normally, the safest way to pick up litter is to work individually and always, face approaching traffic. Trucks should be parked away from the work area, unless needed to provide protection from traffic. The workers may be dropped off and picked up later. The practice of employees walking beside a truck loading litter with a pitchfork or other hand tool should be avoided.

In narrow medians protective vehicles may be necessary at both ends of the work area.

Litterbags should not be filled so full that they will be too hard to lift. The bags should be placed where workers can easily pick them up with minimum exposure to traffic. When possible, the bags should be stockpiled to reduce the number of stops needed for bag removal.

Hypodermic needles should not be placed in the bags. For more information, refer to the special instructions for the Disposal of Hypodermic Needles in the Maintenance Code of Safe Operating Practices. Other sharp objects, heavy metal objects, tire caps, or concrete chunks should not be placed in litterbags. These items could seriously injure the person who picks them up.

When retrieving debris from a freeway lane, workers shall wait for a break in traffic. A break in traffic is defined as all lanes clear of traffic long enough for the employee to walk out, retrieve the debris, and walk back to the shoulder. If no traffic breaks occur, the California Highway Patrol should be contacted to provide one.

Workers shall not try to flag traffic or use hand signals to create a traffic break.

When debris is retrieved from the traveled way, workers shall follow these guidelines:

(A) Workers shall remain in the vehicle until the traffic break approaches.

(B) An escape route shall be planned before leaving the vehicle. The vehicle shall not be parked where it will block the workers' escape route.

(C) When workers are on foot, their vehicle shall be kept between themselves and approaching traffic. Workers shall walk on the outer edge of the shoulder, staying as far from moving traffic as possible.

(D) Workers shall always face approaching traffic.

The above procedures, except the traffic break, should be followed when removing debris from shoulders.

8.20 Maintenance Crews Working Across From Each Other

Maintenance crews shall not work on opposite sides of a highway, directly across from each other.

Work sites on opposite sides of a conventional highway or on opposite sides of one roadway of a divided highway should be at least 2000 feet (600 meters) apart. However, if the traffic is positively controlled by flaggers, stop signs, or traffic signals, the work sites can be closer.

8.21 The Use of the Flashing Arrow Sign (FAS)

Arrow messages pointing left, right, or to both sides, are to be used as action messages. An arrow is to be used only when requiring the motorist to change lanes. An arrow message is not to be used when a vehicle is parked in a closed lane unless it is being used for the arrow closing that lane.

In the flashing arrow mode, all lamps forming the arrowhead and shaft shall flash on and off simultaneously. During hours of darkness the FAS shall be dimmed to prevent the halloing and blurring of the arrow image.

To alert the motorist to work activity near, but not on the traveled way, the caution mode of the FAS is to be used.

Any shadow vehicle working on the traveled way of a multilane highway outside of a lane closure must be run with a FAS board in an arrow mode.

Work vehicles that are being shadowed should usually not display a FAS. Two partially superimposed FASs may not give a clear message.

8.22 Flashing Amber Lights and Rotating Amber Lights

Amber lights shall be used to alert motorists to work activity near, but not on, the traveled way.

Flashing and/or rotating amber lights are to be used on motor graders, snow removal equipment and other specialized equipment that are operated on the traveled way at lower than prevailing traffic speeds.

Flashing amber/rotating lights are to be used on pilot cars not having a FAS.

Amber lights are not to be used while driving at prevailing speeds, when parked in an established lane closure, or when no danger to the employee or motorist exists. Warning lights, to be effective, must only be used when they are needed. A flashing amber light should not be used at the same time as a flashing arrow sign because the arrow becomes more difficult to read.

During the hours of darkness, amber lights should be used with discretion. At times, the vehicles emergency flashers may be more effective.

8.23 Signs

Advance warning signs shall be placed when a stationary operation is on the traveled way or is on the shoulder within 6 feet (1.8 meters) of a traffic lane on a multilane highway with a paved shoulder 8 feet (2.4 meters) or more in width. Also, warning signs shall be placed well in advance of the work, when traffic slows, changes lanes, or moves from its normal course of travel because of the work. The standard signs shown in the 1996 Caltrans Manual of Traffic Controls and in Standard Plans T10 through T17 shall be used.

Portable signs should be placed on sign standards with two or more orange flags. The sign standard shall be in an upright position with the center of the sign panel a minimum of 5 feet (1.5 meters) above the pavement. A cone shall be placed next to each warning sign. If portable signs are displaced or overturned, from any cause, during the progress of work, they shall be immediately replaced in their original locations.

A barrier vehicle or a shadow vehicle shall be used as protection from traffic while setting and retrieving warning signs. A shadow vehicle shall be used as a protective vehicle during the installation and retrieval of traffic cones and signs in the taper and tangent sections of a lane closure.

When work is temporarily stopped or finished and traffic is not affected, all signs shall be promptly removed, dropped down or turned away from traffic. Using signs that do not affect traffic will reduce their effectiveness. In addition, installing them when they are not needed will increase worker exposure to traffic.

Extra warning signs may be used, when appropriate. For example, if queues are expected to develop in lane closures with reversible control, extra 'Prepare to Stop' signs can be installed.

Placing an advance warning sign, such as a 'Road Work Ahead' sign, on the rear of a work vehicle is inadequate and is not permitted. However, an advance warning sign may be used on an advance warning vehicle.

Signs on vehicles with messages such as 'Warning - This Truck Makes Frequent Stops' are advisory only and do little to protect the workers. They should only be used on low speed roads or city streets. When this type of sign is used, an amber light or FAS in the caution mode shall be used along with it.

Signs, such as 'Loose Gravel', 'Fresh Oil', etc., may be placed on barricades. The barricades shall be ballasted by means of sandbags placed on the lower parts of the barricade frame or stays. The sandbags shall not be placed on top of the barricade nor, over any reflectorized barricade rail facing traffic.

8.24 Lane Closures

A lane closure shall be set if a stationary operation takes more than 2 feet (0.60 meters) or reduces the width to less than 10 feet (3 meters) of an existing lane on a multilane highway. To take up to 2 feet (0.60 meters) of a lane on a multilane highway without a lane closure, a cone taper shall be installed that begins at least 300 feet (90 meters) upstream from the work area. The taper shall have 28 inch (700 mm) cones spaced 50 feet (15 meters) apart.

The lane of a two-lane highway shall be closed if work reduces the width of a lane to less than 10 feet (3 meters). Traffic shall not be moved across the center stripe without a lane closure or other means of traffic control.

A space of 6 feet (1.8 meters) should be maintained, whenever possible, between moving traffic and the work area.

When closing a lane, a barrier vehicle or a shadow vehicle shall be used for the installation of the signs and the FAS if they can be placed while off the traveled way on the shoulder or median. A shadow vehicle or a barrier with a TMCC shall be used as the protective vehicle during the installation and retrieval of traffic cones and signs in the taper and tangent sections of the lane closure. All devices placed in areas with no shoulders from an open lane require the use of a shadow vehicle for protection.

Lane closures shall be placed according to the Standard Plan T10, Traffic Control System for Lane Closure on Freeways and Expressways or the Standard Plan T11, Traffic Control System for Lane Closure on Multilane Conventional Highways.

If a lane closure begins to cause traffic to back up (commonly called queuing), the advance warning signs shall be moved back in advance of queuing. If the signs cannot be moved back, the lane closure must be removed. If the lane closure results in a significant traffic delay, the closure may need to be removed.

A Changeable Message Sign (CMS) may also be used to redirect traffic and relieve queuing. The additional CMS may be used at key interchanges and exit ramps and other locations where traffic queues may be expected due to maintenance activities.

8.25 Placing the Flashing Arrow Sign (FAS)

The flashing arrow sign (FAS) should be placed on the shoulder at the beginning of the taper as shown in Standard Plan T10. If there is no shoulder, the FAS should be placed as close to the beginning of the taper as possible. A minimum 1500 feet (450 meters) of sight distance shall be provided where possible for vehicles approaching the first FAS.

If the FAS cannot be located properly, consider placing the taper in a different or safer location.

In multilane closures on freeways and expressways (Standard Plan T10), one FAS must be used for each lane closed. The first FAS used should be a Type 1 (4 x 8 feet) (1200 mm x 2400 mm). The second and succeeding FAS may be either a Type 1 or Type 2.

8.26 Closing Auxiliary Lanes

Work occurring at the beginning of an auxiliary lane such as a truck lane or lane added to increase capacity, will require as a minimum the shoulder closure plan shown on Standard Plan T10 plus these additional requirements:

(A) A road work ahead (C23) sign instead of the shoulder work ahead (C24) sign on the shoulder upstream from the beginning of the auxiliary lane.

(B) Cones on the shoulder stripe from the C23 sign continuously to the auxiliary lane line.

(C) A land closed (C30) sign in the closed lane about 100 feet (30 meters) from its beginning and every 2,000 feet (600 meters) after that.

If the work site is a considerable distance from the beginning of the auxiliary lane and the above method is not practical, the lane shall be closed according to the Standard Plan T10. If the auxiliary lane is located at an exit ramp or connector, the closure plan in Standard Plan T14 shall be used.

8.27 Flagging Operations

Any time two-way traffic must share the same lane because of work in the other lane, a flagging operation must be set up. See Standard Plan T13.

Flaggers shall receive on the job training before going on duty and shall follow the flagging procedures described in the 1996 Caltrans Manual of Traffic Controls, Revision 1, Section 5-02.5, One Lane, Two Way Traffic Control and Section 5-04, Hand Signaling Control. They should be rotated and relieved periodically to maintain alertness.

In areas where flagger visibility is reduced, it is recommended that flaggers wear white coveralls and the proper warning garments as described in the Departmental Safety Manual, Chapter 12, Section 12.20. This will increase the flaggers' contrast with orange equipment and will make them more visible to approaching traffic.

On some two-lane roads one flagger may be used to control traffic. Traffic volume must be very light and the length of the one lane section should be short so that one end is visible from the other. The sight distance for approaching vehicles must be long enough that traffic can be safely controlled from one end of the work zone. This method must be approved by the Supervisor.

The cones on the centerline shown in Standard Plan T13 may be eliminated at the Supervisors' discretion if a pilot car is used. The pilot car shall have radio contact with personnel in the work area and the maximum speed of the pilot car through the traffic control zone shall be 25 miles (40 kilometers) per hour.

The minimum distance required between the flagger and the work area is listed in Table 1, Standard Plan T13.

Flaggers shall be used when the drivers vision is impaired because of smoke or dust in work zones. They shall also be used to protect trucks that must turn on the traveled way to load or dump. The flagging procedures in the 1996 Caltrans Manual of Traffic Controls, Revision 1, Section 5-02.5, One Lane, Two Way Traffic Control and Section 5-04, Hand Signaling Control shall be followed.

Where the end of a one-lane section is not visible from the other end, the flaggers shall maintain contact by means of radio or field telephones.

Except for unusual circumstances or emergencies, flaggers should not be used on freeways.

Traffic signals may be used to control traffic on two lane roads. The operation must conform to Section 9-03 of the Caltrans Traffic Manual.

8.28 Standard Exceptions to Lane Closure Procedures

(A) Limited Work on the Traveled Way, Without Lane Closures.

Short-term operations may be conducted on the traveled way without using a lane closure or signs. Pothole patching and debris retrieval, are examples of brief operations. To use this method all of the following conditions must exist:

(1) The traffic volume must be light. This means the worker can walk from the shoulder to the site on the traveled way, do the job and walk back to the shoulder without interfering with traffic.

(2) Sight distance shall be at least 500 feet (150 meters) in each direction. Where 500 feet (150 meters) of sight distance is not available at the work site, one or more lookouts may be posted to extend visual coverage.

(3) Vehicles must be parked completely off the traveled way.

If all three of these conditions exist, the supervisor may instruct workers to perform the work on a specified section of highway without a lane closure. All of the following work methods shall be used:

(a) When the crew consists of at least two workers, one of the workers shall act as a lookout. The lookouts exclusive duty will be to continually watch for approaching traffic and to warn the worker whenever trouble is suspected.

(b) The lookout shall not carry a flag or paddle and shall do nothing to control or influence traffic. All workers shall be off the traveled way when traffic passes.

(c) Only one production worker shall be on the traveled way, unless more are needed to reduce the exposure time.

(d) Workers shall face approaching traffic whenever possible.

(e) Workers shall have a planned escape route.

(f) A FAS in the caution mode or a flashing amber light shall be operating.

(g) Road Work Ahead (C23) signs are not required, since passing traffic is not to be affected.

(B) Pavement Marking and Relamping Operations

A supervisor may allow pavement marking and relamping operations on the traveled way without a lane closure. The posted speed limit must be less than 55 miles (88 kilometers) per hour and the work must take less than 10 minutes to complete. The supervisor may also use devices such as signs, barrier vehicles, and lookouts to increase worker protection.

(C) Chain Controls

Lane closures are not required in chain control operations. However, on multilane highways, they may be used to create a cushion between Caltrans workers and fast vehicles leaving the snow area. In addition, a supervisor may use lookouts and barrier vehicles to increase worker protection.

(D) Moving Shoulder Operations

The supervisor may allow moving shoulder operations next to the traveled way without a lane or shoulder closure. Shoulder grading, mowing, and spraying operations are examples of moving shoulder operations. The work must leave at least 10 feet (3 meters) of the lane next to the shoulder open to traffic. On two lane conventional highways, traffic shall not be moved across the center stripe without a lane closure or other means of traffic control.

8.29 Moving Lane Closures

Any slow moving, unshadowed vehicle working in a freeway lane outside a lane closure shall have a TMCC and FAS or it shall be followed by a shadow vehicle. The only exceptions to this rule are tow trucks and snow removal/de-icing equipment.

Before employees work in a moving lane closure, a discussion should be held so that all involved employees will know what their role in the operation is and how to proceed safely.

For information on vehicle spacing, vehicle positioning, and signing refer to the Traffic Control System For Moving Lane Closure On Multilane Highways (T15 and T16) and on Two Lane Highways (T17).

All vehicles used as shadow trucks shall be equipped as defined in Section 8.12, Protective Vehicles. Radio communication in all vehicles is required.

Other requirements, for moving lane closures and shadowing moving operations, found in the Maintenance Code of Safe Operating Practices, shall be followed.

8.30 Shoulder Closures

Shoulder closures are used to guide motorists around stationary operations on shoulders. A shoulder closure is optional on unpaved shoulders and two-lane roads. It must be kept in mind that shoulder closures provide no physical protection.

A shoulder closure is required for a stationary operation on a multilane highway with a paved shoulder 8 feet (2.4 meters) or more in width whenever vehicles or equipment are parked on the shoulder within 6 feet (1.8 meters) of a traffic lane. Shoulder closures are to be set up as described on Standard Plans T10.

Shoulders used as part time lanes should be closed in the same way as lanes are closed.

A properly placed barrier vehicle shall be used with shoulder closures to protect workers.

8.31 Parking

Before a vehicle is parked, the driver shall consider if the vehicle will be needed to perform the work. If not, the vehicle should be used for the physical protection of workers. If it is used for protection, refer to Section 8.12, Protective Vehicles. If it will not be used for physical protection or for work, the vehicle shall be parked where it will not affect passing traffic.

All vehicles should be parked on the same side of the highway (see Section 8.20, Maintenance Crews Working Across From Each Other).

If a vehicle is parked on the shoulder within 6 feet (1.8 meters) of a traffic lane on a multilane highway with a paved shoulder 8 feet (2.4 meters) or more in width for more then 10 minutes then the shoulder must be closed as shown in Standard Plans T10. This is not necessary on city streets where parking is expected.
Whenever possible, a vehicle shall be entered and exited on the side away from traffic, even though

it may be harder to do so. This will reduce worker exposure. If possible, workers shall not stand or work near the back of vehicles. Also, whenever possible, workers shall not work directly in front of vehicles.

8.32 Night Work

Extra caution is necessary at night when both motorists and workers visibility is reduced.

Each employee must be informed about the hazards of working at night.

Careful planning is necessary and all the potential problems that may be encountered while working on or near the traveled way should be considered.

During the hours of darkness, workers on foot must wear the proper warning garments as described in the Departmental Safety Manual, Chapter 12, Section 12.20, and white coveralls. However, Supervisors should not require white coveralls in snow or fog areas where a mostly white background might lower worker visibility. Supervisors should not require white coveralls in weather requiring rain gear.

The rain gear jacket shall be reflectorized for nighttime wear. Reflective material may also be worn on hard hats.

Sufficient light should be provided at the work site. Light plants, floodlights, or work lights shall be mounted and directed in a manner to allow employees to work safely and to prevent glare to approaching traffic.

Because of the risk to workers, nighttime call outs should be kept to a minimum. If there is no danger to the public, repairs should wait until the next day. For example, if the damaged facility does not encroach on paved shoulder areas or is more than 3 feet (900 mm) from the traveled way in unpaved shoulder areas, there should not be a nighttime call out except to place barricades. It is up to the Supervisor to decide when it is appropriate to call out a crew for quick, temporary repairs or to wait until daylight.

Call outs should be made when warning or regulatory signs have been knocked down and pose immediate danger to the motorist. Also, Supervisors should consider responding at night for broken water lines, damaged phone or electrical lines, or spills where environmental damage may occur.

Each District will advise all local law enforcement agencies of this call out policy.

During nighttime lane closures, all traffic cones should be retro-reflective as described in the 1996 Caltrans Manual of Traffic Control, Section 5-05.6, Revision 1, Channelizing Devices.

If the one-piece solid, opaque sleeves are used for retro-reflection, they should be removed during daylight hours. If banded or transparent reflective sleeves are used, they can be left on the cone during daylight hours.

All warning signs used at night shall be made with high performance reflectorized sheeting.

During hours of darkness, the lights on the Flashing Arrow Sign shall be dimmed to prevent the halloing and blurring of the arrow image.

8.33 Working Equipment Against Traffic

Operating equipment against traffic is permitted when working on the shoulder or within a lane closure. This may be desirable in some cases. For example, during crack sealing operations, employees would have the added protection of the work vehicle between themselves and approaching traffic. Headlights shall be turned on during the daylight hours when working against traffic. They should be turned off at night when working against traffic because they might confuse motorists.

8.34 Operating Maintenance Equipment

Caltrans owns many types of equipment. Employees may be expected to operate anything from a sedan to a snow blower; from pruning shears to chain saws; and from hammers to powder actuated nail guns.

Supervisors should allow only trained employees to operate equipment. When a qualification program is in place for a given type of equipment, employees shall not operate equipment unsupervised, until, they have been qualified by the Department.

Trucks or other mobile equipment which leave a freeway lane, that is open to the public, to enter the construction area, shall slow down gradually in advance of the location of the turnoff to give following public traffic an opportunity to slow down. When leaving a work area and entering a roadway carrying public traffic, the equipment, whether empty or loaded, shall in all cases yield to public traffic.

All equipment shall be operated as designed by the manufacturer. All manufacturers' safety directions shall be followed.

Operators shall not repair equipment unless they have been properly trained to do so.

8.35 Tailgates of Trucks

Workers shall not use their hands or fingers to clear debris from the tailgates of dump trucks. They shall use a shovel, digging bar or other device to remove debris.

8.36 Compressed Air

Air under pressure, if not properly handled, can be hazardous. Air nozzles shall not be pointed at a worker's body to dust off clothing.

Tanks or drums shall not be filled with compressed air, if they were not, designed to be used as an air tank.

Air hoses shall be checked regularly to ensure that they are in good condition. Cracked or leaking hoses shall be removed from service and replaced. Compressed air tanks should be checked and drained weekly.

Compressed air-tank operating permits should be conspicuously displayed and kept current. Air tanks shall be inspected as required by the Unfired Pressure Vessel Safety Orders, ß461.

All compressed air equipment and plumbing shall meet the requirements of the Unfired Pressure Vessel Safety Orders.

8.37 Working On Machinery And Equipment

Workers shall not work on electrical or mechanical equipment unless they are competent to do so.

Every power driven machine equipped with lockable controls or readily adaptable to lockable controls shall be locked out or positively sealed in the “off” position during repair, servicing or adjusting work. Machines not equipped with lockable controls or readily adaptable to lockable controls shall be de-energized or disconnected from its source of power. In all cases, accident prevention signs and/or tags shall be placed on the controls of the machines during repair work.

No one shall remove the tag or unlock the switch except the person who placed it.

During repair, machines or equipment shall be effectively blocked or otherwise secured to prevent inadvertent movement if such movement can cause injury to employees.

For example, before working underneath any vehicle and/or equipment to adjust or inspect it, steps shall be taken to ensure that the vehicle cannot move. Shut off the engine, set the brakes and physically block the wheels with wheel chocks before any work begins.

Remove the keys from the vehicle and place a 'Do Not Operate' tag in the ignition switch, on the steering wheel or some other very visible location. When working on a motor grader or other equipment that has implements such as blades, plows or buckets attached, you must lower them to the ground or block and/or chain them up before working underneath them.

Never get under a vehicle supported only by a jack. Use an approved safety stand designed to allow workers underneath the vehicle that is rated for the weight that they are expected to carry.

Do not work under a raised dump bed or other raised vehicle bed, unless the safety stand is in place. Raise the bed, place the stand in its holder and lower the bed onto the stand before beginning the work.

Depressurize air and hydraulic hoses before working on them. Do not search for hydraulic leaks with your hands; use a piece of wood or cardboard. Hydraulic fluid or air under pressure could enter your skin and cause serious injury.

Bleed pressure on spray tanks before opening or working on them. This includes chemical spray tanks, emulsion tanks on trucks or trailers, and even Hudson type pump sprayers.

Before adjusting, cleaning or repairing brush chippers, read the operators manual and take steps to ensure that all potential energized parts have been locked out. This includes the guillotine guards on those so equipped and all parts of the rotating drum.

This information is provided to help employees comply with the General Industry Safety Orders, ß3314, Cleaning, Repairing, Servicing and Adjusting Prime Movers, Machinery and Equipment.

8.38 Work On Electrical Circuits

Only qualified persons shall work on electrical equipment or systems. All work performed directly on or in proximity to electrical installations, equipment or systems operating or intended to operate on systems of 600 volts or less shall comply with the Low Voltage Electrical Safety Orders. All work performed on systems operating at more than 600 volts shall comply with the High Voltage Electrical Safety Orders.

The Codes of Safe Operating Practices for work performed on electrical equipment or systems contain more information on the specific hazards and on the proper safety procedures to follow while performing the work.

This section does not apply to installations of conductors and equipment in vehicles, operating at less than 50 volts or to their ignition systems.

8.39 Working Near Utilities

(A) Overhead Utilities:

Workers shall not be required or permitted to perform any function in proximity to energized high voltage lines. Any activity where any parts of tools, machinery, materials or any part of an employee's body will come closer than the minimum clearances from energized overhead lines set forth in the following table is prohibited.
Boom equipment must not be operated where the boom could come within the minimum required clearance set forth in this table. Hoisting over energized lines is prohibited.

Nominal Voltage (Phase to Phase)	Minimum Required Clearance (Feet)	Minimum Required Clearance (Meters)
600.....50,000	10	3
Over 50,000 75,000	11	3.4
Over 75,000 125,000	13	4
Over 125,000. ..175,000	15	4.6
Over 175,000.. .250,000	17	5.2
Over 250,000... 370,000	21	6.4
Over 370,000.... 550,000	27	8.2
Over 550,000...1,000,000	42	12.8

Figure 8-2: Overhead Utilities

Any overhead conductor shall be considered to be energized unless and until the person owning or operating such line verifies that the line is not energized and the line is visibly grounded at the work site.

If downed power lines are located, workers shall not try to move or repair them. They shall stay clear and call the experts; normally, the local power company will respond.

(B) Underground Utilities:

Before any digging or excavations are begun, the area shall be checked to determine if there are any buried utilities. Some examples of digging or excavations requiring checking would be installing a new sign post, guide marker, snow pole, shoulder grading or ditch/culvert cleaning. Utility markers or buildings that have no above ground source of power can indicate underground utilities. If the excavation will be conducted in an area, which is known, or reasonably should be known, to contain subsurface installations, only hand tools shall be used for digging.

The Superintendent or Supervisor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to commencing any excavation with power tools.

The regional notification centers include but are not limited to the following:

Notification Center	Telephone
Underground Service Alert Northern California (USA)	1-800-642-2444
Underground Service Alert Southern California (USA)	1-800-422-4133
South Shore Utility Coordinating Council (DIGS)	1-800-541-3447
Western Utilities Underground Alert, Inc.	1-800-424-3447

If the excavation will be conducted in an area which is known, or reasonably should be known, to contain Caltrans electrical facilities, the Superintendent or Supervisor shall notify the Electrical Supervisor for the area, prior to commencing any excavation.

8.40 Confined Spaces

Workers need to be aware of confined space hazards.

A confined space is any location that meets the following definition:

1) an employee can physically enter, and

2) has limited or restricted means of entry or exit, and

3) is not designated for continuous employee occupancy.

For Caltrans employees, confined spaces include structures or facilities such as tanks, bridge cells, shafts, pits, bins, tubes, pipelines, deep trenches, vaults, vats, pump houses or compartments, sewage lift stations, culverts, cofferdams, elevator pits, or similar locations.

No person will be allowed to enter a confined space unless all workers involved have been trained in the operating and rescue procedures and have reviewed the Departmental Safety Manual, Chapter 14, Confined Spaces and the Maintenance Code of Safe Operating Practices, Appendix B, Confined Space Entry Procedures. Supervisors must ensure workers are properly trained and have read this material and understand it.

All employees who are designated as hands on users of instruments for testing for hazardous gases and oxygen deficiency must be trained in Confined Space Safety every 2 years.

8.41 Trench And Excavation Safety

Employees shall review the Maintenance Code of Safe Operating Practices, Appendix D, Trench and Excavation Safety Guidelines before working in or near trenches or excavations. Supervisors shall ensure employees understand and follow these guidelines.

Caltrans workers shall not enter any trench or excavation that has been dug by others until a supervisor or superintendent has inspected the trench/excavation and the surrounding area to identify and/or correct any hazards. The supervisor or superintendent must be competent and knowledgeable about soil classification, shoring/sloping techniques and requirements, access requirements, and the hazards of underground work.

If there is any doubt about the safety of an excavation, an engineering opinion shall be obtained before any work starts.

All work in trenches/excavations shall comply with the Construction Safety Orders, Article 6, Excavations.

8.42 Ladders

Ladders shall be maintained in good condition at all times, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the movable parts shall operate freely without binding or undue play.

Metal ladders shall not be used while working on electrical equipment. All metal ladders shall be marked with a sticker or stencil that clearly says: ‘Caution–Do Not Use Around Electrical Equipment’.

Supervisors shall periodically inspect ladders for wear and damage. All ladders shall be cleaned of oil, grease, or slippery materials. Ladders which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as ‘Dangerous, Do Not Use’.

8.43 Handling Hazardous Substances

See Chapter D5, the First Responder Operations Reference Manual, and the Maintenance Hazardous Waste Manual for more information on this subject.

8.44 Radioactive Incidents

See Chapter D5 - Spills of Substances on Highway Rights of Way and the First Responder Operations Reference Manual.

8.45 Chemicals

See Chapter C2 - Vegetation Control, and Chapter D5 - Spills of Substances on Highway Rights of Way, for details on this subject.

8.46 Explosives

Care in handling and storing explosives are specified in Chapter 5 - Blasting.

8.47 Use of Reclaimed Water

Before employees use reclaimed water, they shall be told about the potential health hazards involved with contact or accidental ingestion of reclaimed water. They shall also be trained how to properly clean up after using it.

Reclaimed water must meet applicable coliform and health standards before, it can be used by Caltrans personnel, for irrigation, or dust control. The county health department shall be contacted for guidance.

Contact with reclaimed water shall be kept to a minimum. Workers shall use impermeable (rubber) gloves and appropriate protective clothing. Supervisors should contact the local supplier to determine what other specific precautions should be taken.

Employees must have clean water and soap available at the work site when using reclaimed water. Workers shall be instructed to wash their hands thoroughly before eating, drinking, smoking, or going to the bathroom.

More information on the use of reclaimed water is found in the Maintenance Code of Safe

Operating Practices.

Refer to the attached pages for the Standard Plans

APPENDIX T10 - Traffic Control System For Lane Closure on Freeways and Expressways

APPENDIX T10A - Traffic Control System For Lane And Complete Closures on Freeways and Expressways

APPENDIX T11 - Traffic Control System For Lane Closure on Multilane Conventional Highways

APPENDIX T12 - Traffic Control System For Lane Closure on Multilane Conventional Highways

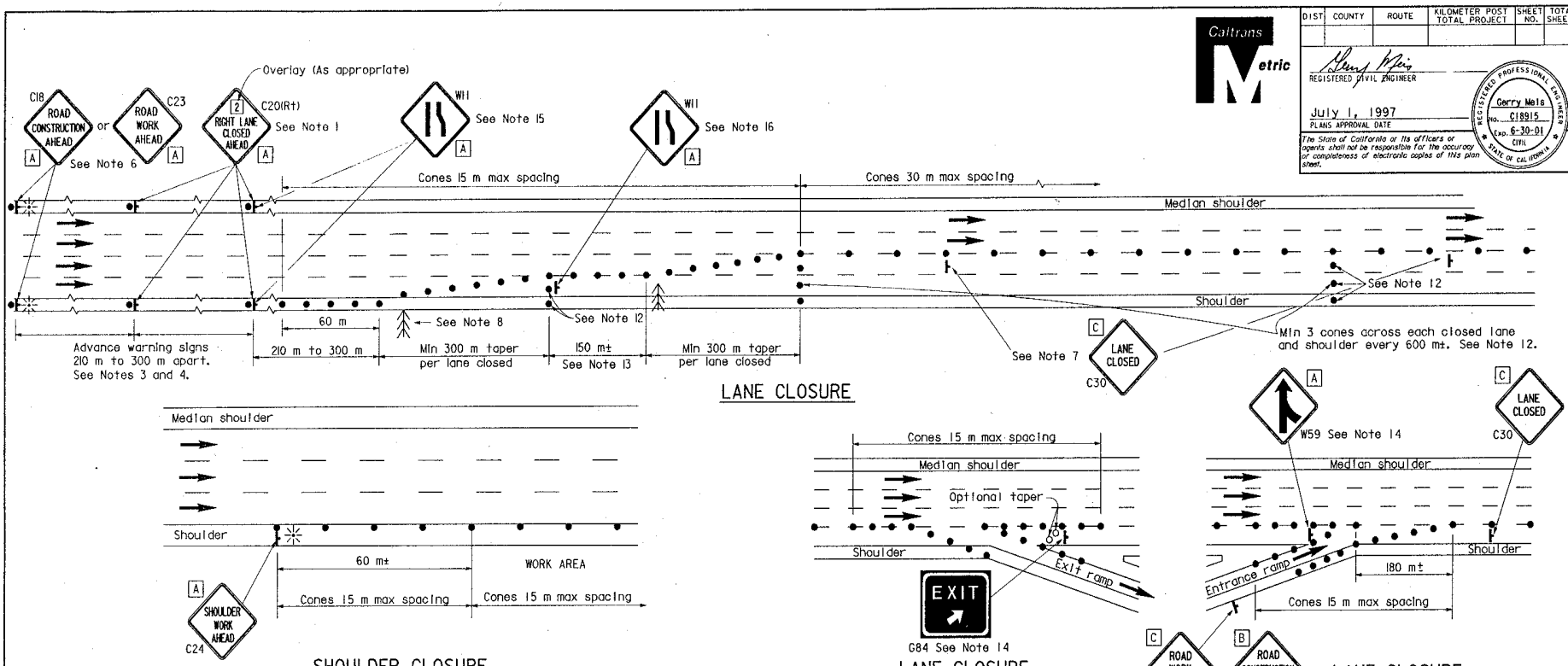
APPENDIX T13 - Traffic Control System For Lane Closure on Two Lane Conventional Highways

APPENDIX T14 - Traffic Control System For Ramp Closures

APPENDIX T15 - Traffic Control System For Moving Lane Closure on Multilane Highways

APPENDIX T16 - Traffic Control System For Moving Lane Closure on Multilane Highways

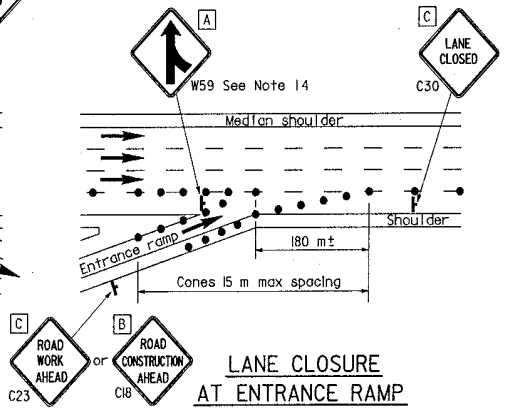
APPENDIX T17 - Traffic Control System For Moving Lane Closure on Two Lane Highways



LANE CLOSURE

SHOULDER CLOSURE

LANE CLOSURE AT EXIT RAMP



LANE CLOSURE AT ENTRANCE RAMP

NOTES

1. Median lane closures shall conform to the details for outside lane closures except that C20 (Lt) signs shall be used.
2. Not less than one person shall be assigned to full time maintenance of traffic control devices on all night lane closures or day-time closures exceeding 1.6 km in length, including taper.
3. Duplicate sign installations are not required:
   a) On opposite shoulder if at least one-half of the available lanes remain open to traffic.
   b) In the median if the width of the median shoulder is less than 2.4 m and the outside lanes are to be closed.
4. All advance warning sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane closure.
5. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious or ends within a larger project's limits.
6. If the C18 (or C23) sign would follow within 600 m of a stationary C18, C23 or C11 "STATE HIGHWAY CONSTRUCTION NEXT_____ MILES", use a C20 sign for the first advance warning sign.
7. Place a C30 sign every 600 m throughout length of lane closure.
8. One flashing arrow sign for each lane closed. The first flashing arrow sign shall be Type I. All others may be either Type I or Type II.
9. A minimum 450 m of sight distance shall be provided where possible for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at top of crest vertical curve or on a horizontal curve.
10. All cones used for night lane closures shall be fitted with reflective sleeves as specified in the specifications.
11. Portable delineators, placed at one-half the spacing indicated for traffic cones may be used in lieu of cones for daytime closures only.
12. Unless otherwise specified in the special provisions, a minimum of 3 cones shall be placed transversely across each closed lane and shoulder at each location where a taper across a traffic lane ends and every 600 m as shown on the "Lane Closure" detail. Two Type II barricades may be used instead of the 3 cones. The transverse alignment of the cones or barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.
13. Unless otherwise specified in the special provisions, the 150 m section of the lane closure shown along lanelines shall be used between the 300 m lane closure tapers when two or more adjacent traffic lanes are to be closed.
14. Unless otherwise specified in the special provisions, the G84 and W59 signs shall be used as shown.
15. Where specified in the special provisions, a W11 "LANE REDUCTION SYMBOL" sign is to be used in place of the C20 "RIGHT LANE CLOSED AHEAD" sign.
16. The W11 "LANE REDUCTION SYMBOL" sign shown at this location is to be used where the W11 sign is used as advance warning as described in Note 15.

SIGN PANEL SIZE (Min)

A	1200 mm x 1200 mm
B	900 mm x 900 mm
C	750 mm x 750 mm

LEGEND

- Traffic Cone
- Traffic Cone (optional taper)
- Portable Sign
- Flashing Arrow Sign
- Direction of Travel
- Portable Flashing Beacon

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON FREEWAYS AND EXPRESSWAYS

NO SCALE

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Caltrans Metric

REGISTERED CIVIL ENGINEER

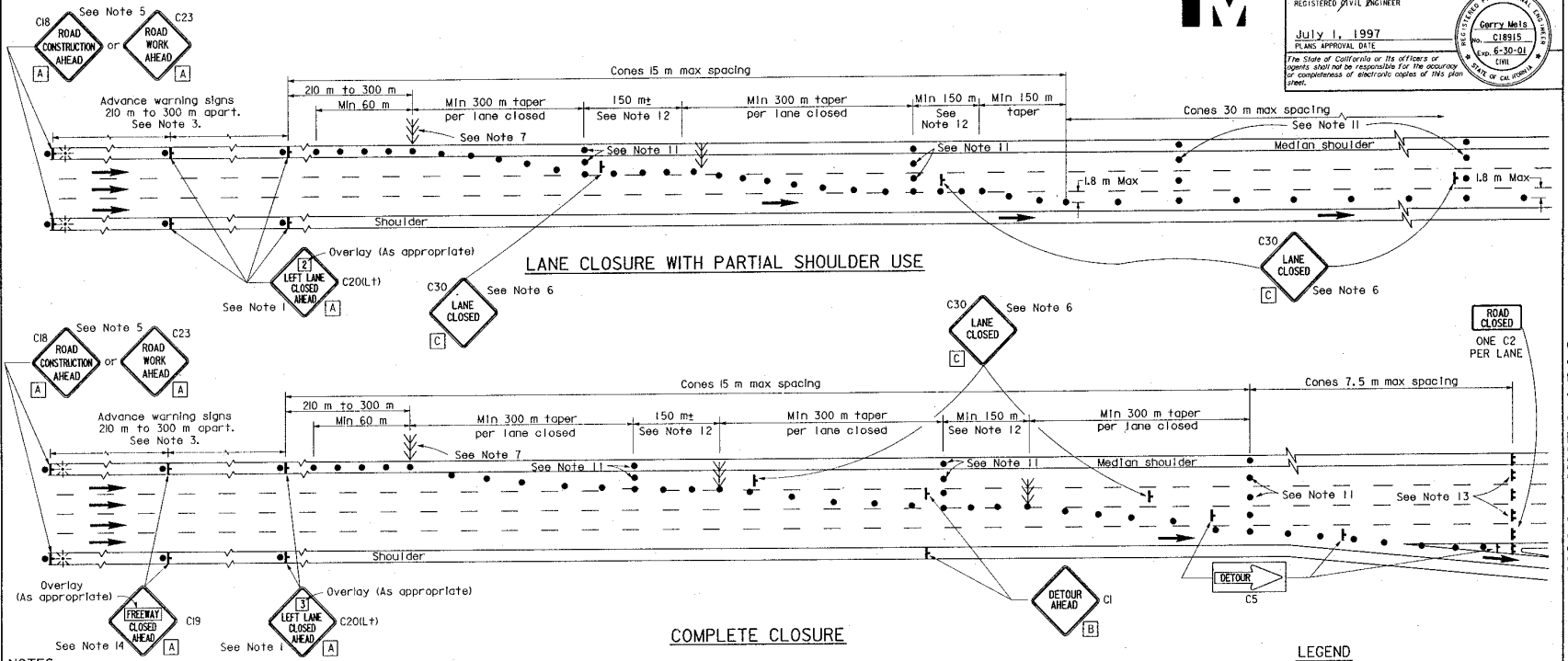
July 1, 1997
PLANS APPROVAL DATE

Gerry Weis
No. C18915
Exp. 6-30-01
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

STD. PLAN T10

T10



NOTES

1. Lane closures on the right side using partial median shoulder as a traffic lane shall conform to the details for inside lane closure except that C20(Rt) signs shall be used.
2. Not less than one person shall be assigned to full time maintenance of traffic control devices on all complete closures, on all night lane closures, and daytime closures exceeding 1.6 km in length, including taper.
3. All advance warning sign installations shall be equipped with flags for daytime closure. Flashing beacons shall be placed at the locations indicated during night lane closures.
4. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious or ends within a larger project's limits.
5. If the C18 (or C23) sign would follow within 600 m of a stationary C18, C23 or C11 "STATE HIGHWAY CONSTRUCTION NEXT ___ MILES" use a C20 sign for the first advance warning sign.
6. Place a C30 sign every 600 m throughout length of lane closure.
7. One flashing arrow sign for each lane closed. The first flashing arrow sign shall be Type I. All others may be either Type I or Type II.
8. A minimum 450 m of sight distance shall be provided where possible for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at the top of crest vertical curve or on a horizontal curve.
9. All cones used for night lane closures shall be fitted with reflective sleeves as specified in the specifications.
10. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
11. Unless otherwise specified in the special provisions, a minimum of 3 cones shall be placed transversely across each closed lane and shoulder at each location where a taper across a traffic lane ends and every 600 m as shown on the "Lane Closure With Partial Shoulder Use" detail. Two Type II barricades may be used instead of the 3 cones. The transverse alignment of the cones or barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.
12. Unless otherwise specified in the special provisions, the 150 m section of the lane closure shown along lanelines shall be used between the 300 m lane closure tapers when two or more adjacent traffic lanes are to be closed.
13. A minimum of Two Type II barricades shall be placed across each closed lane and shoulder at the location shown and every 600 m within the complete closure area. Within the complete closure area, the transverse alignment of the barricades on the closed shoulder may be shifted from the transverse alignment to provide access to the work.
14. Where specified in the special provisions, a C1 "DETOUR AHEAD" sign is to be used in place of the C19 "FREEWAY CLOSED AHEAD" sign.

SIGN PANEL SIZE (Min)

A	1200 mm x 1200 mm
B	900 mm x 900 mm
C	750 mm x 750 mm

LEGEND

- Traffic Cone
- Portable Sign
- Flashing Arrow Sign
- Direction of Travel
- Portable Flashing Beacon

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE AND COMPLETE CLOSURES ON FREEWAYS AND EXPRESSWAYS

NO SCALE

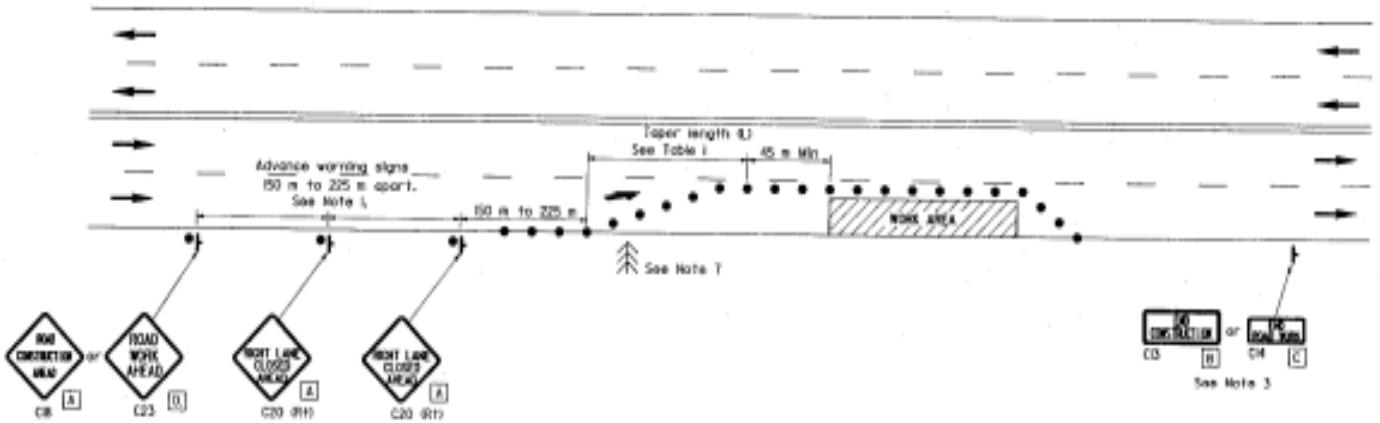
T10A

STD. PLAN T10A

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER
July 1, 1997
PLANS APPROVAL DATE
Gerry Weis
No. C18915
Exp. 6-30-01
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

TYPICAL LANE CLOSURE



SIGN PANEL SIZE (Min)

A	900 mm x 900 mm
B	1200 mm x 450 mm
C	900 mm x 450 mm
D	750 mm x 750 mm

LEGEND

- Traffic Cone
- Portable Sign
- Direction of Travel
- Flashing Arrow Sign

NOTES

1. Where approach speeds are low, signs may be placed at 90 m spacing and in urban areas, closer.
2. All advance warning sign installations shall be equipped with flags for daytime closures.
3. A C3 "END CONSTRUCTION" or C4 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a longer project's limits.
4. If the C8 (or C23) sign would follow within 600 m of a stationary C8, C23, or C1 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C20 sign for the first advance warning sign.
5. All cones used for night lane closures shall be fitted with reflective sleeves as specified in the specifications.
6. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
7. Flashing arrow sign shall be either Type I or Type II.
8. The maximum spacing between cones in a taper shall be approximately as shown in Table I and 8 m maximum spacing on tangent.
9. For approach speeds over 80 km/h, use the "Traffic Control System for Lane Closure On Freeways And Expressways" plan for lane closure details and requirements.
10. Where specified in the special provisions, a W1 "LANE REDUCTION SYMBOL" sign is to be used in place of the C20 "RIGHT LANE CLOSED AHEAD" sign.

TABLE I

Approach Speed (km/h)	* Taper Length (L) (m)	* Number of Cones for Taper	Spacing of Cones Along Taper (m) †
0-40	38	6	7.5
40-65	98	9	12
65-80	183	13	15
Over 80	See Note 9		

* Based on 3.6 m wide lane. This column is also appropriate for lane widths less than 3.6 m.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON MULTILANE CONVENTIONAL HIGHWAYS

NO SCALE

T11

STD. PLAN T11

DIST	COUNTY	ROUTE	KILOMETER POST / TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

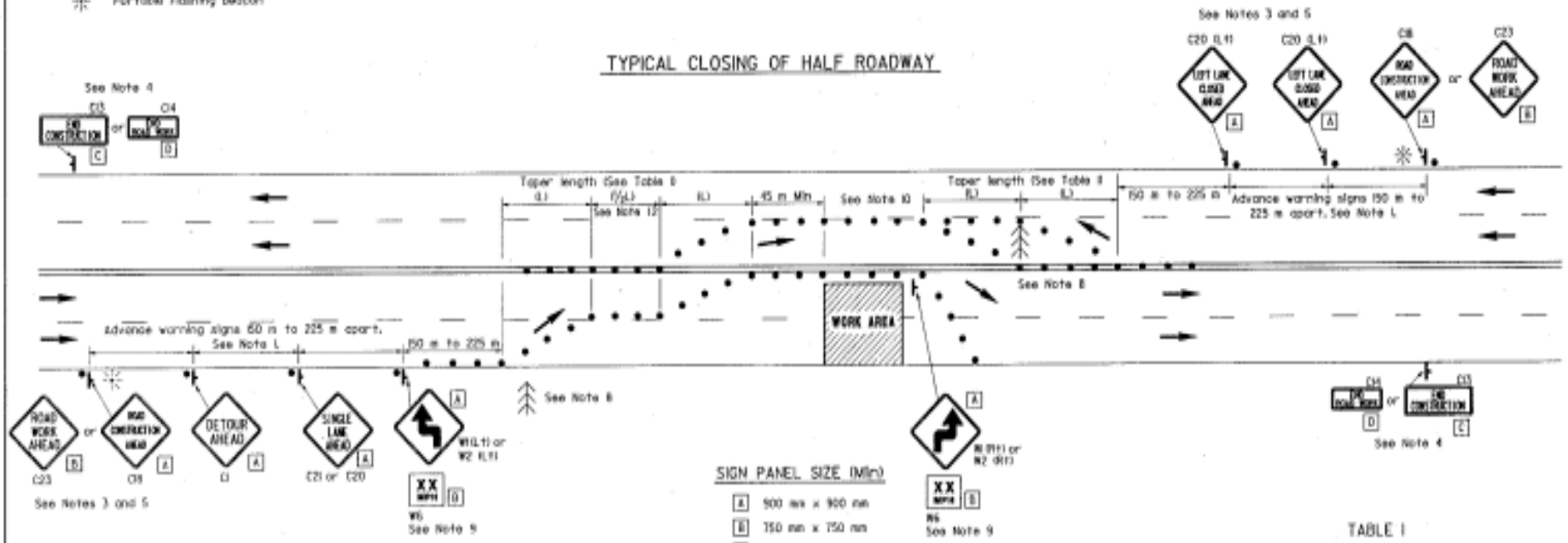
July 1, 1997
PLANS APPROVAL DATE

Caltrans Metric

LEGEND

- Traffic Cone
- Portable Sign
- Flashing Arrow Sign
- Direction of Travel
- Portable Flashing Beacon

TYPICAL CLOSING OF HALF ROADWAY



SIGN PANEL SIZE (Min)

A	900 mm x 900 mm
B	750 mm x 750 mm
D	900 mm x 450 mm
C	1200 mm x 450 mm

TABLE I

Approach Speed km/hr	* Taper Length (L) (m)	* Number of Cones for Taper	Spacing of Cones Along Taper (m) †
0-40	38	6	7.5
40-65	98	9	12
65-80	183	13	15
Over 80	See Note 11		

* Based on 3.6 m wide lane. This column is also appropriate for lane widths less than 3.6 m.

NOTES

1. Where Approach speeds are low, signs may be placed at 90 m spacing and, in urban areas, closer.
2. Not less than one person shall be assigned to full time maintenance of traffic control devices on all night lane closures.
3. All advance warning sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane closures.
4. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project's limits.
5. If the C18 (or C23) sign would follow within 600 m of a stationary C18, C23, C11 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C20 sign for the first advance warning sign.
6. All cones used for night lane closures shall be fitted with reflective sleeves as specified in the specifications.
7. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
8. Flashing arrow signs shall be either Type I or Type II.
9. Advisory speed will be determined by the Engineer. The W6 Sign will not be required when advisory speed is more than the posted or maximum speed limit.
10. The maximum spacing between cones within a taper shall be approximately as shown in Table I and the maximum spacing on tangent shall be 15 m.
11. For approach speeds over 80 km/h, use the "Traffic Control System For Lane Closure On Freeways And Expressways" plan for lane closure details and requirements.
12. Unless otherwise specified in the special provisions, the (1/2L) shown between the two (L) lane closure tapers shall be used.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON MULTILANE CONVENTIONAL HIGHWAYS

NO SCALE

T12

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

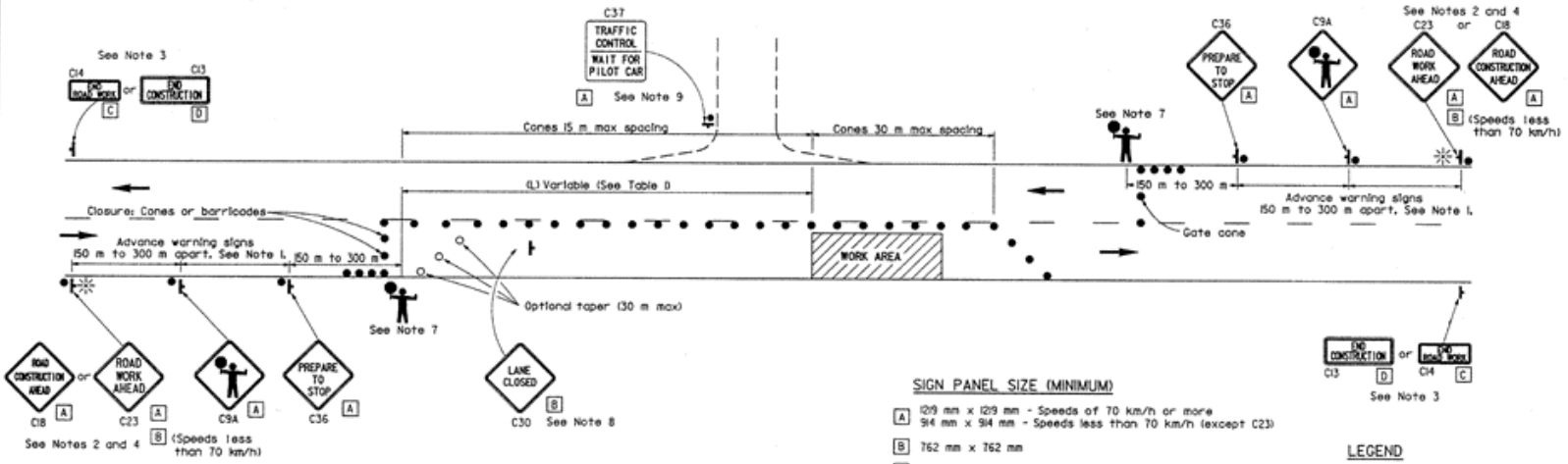
REGISTERED CIVIL ENGINEER

July 1, 1999
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

REGISTERED PROFESSIONAL ENGINEER
G. W. Edwards
No. C36386
Exp. 6-30-00
CIVIL
STATE OF CALIFORNIA

TYPICAL LANE CLOSURE WITH REVERSIBLE CONTROL



SIGN PANEL SIZE (MINIMUM)

- A 1219 mm x 1219 mm - Speeds of 70 km/h or more
  914 mm x 914 mm - Speeds less than 70 km/h (except C23)
- B 762 mm x 762 mm
- C 914 mm x 457 mm
- D 1219 mm x 457 mm

TABLE I

Approach Speed (km/h)	* (L) (m)±
0-50	60
50-70	90
over 70	150

* Increase by 20 percent on sustained downgrades steeper than 3 percent and longer than 1.6 km.

LEGEND

- Traffic Cone
- Traffic Cone (optional taper)
- Portable Sign
- Direction of Travel
- Portable Flashing Beacon
- Flagger

NOTES

1. Where approach speeds are low, signs may be placed at 90 m spacing, and in urban areas, closer.
2. All advance warning sign installations shall be equipped with flags for daytime closures. Flashing beacons shall be placed at the locations indicated during night lane closures.
3. A C13 "END CONSTRUCTION" or C14 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane control unless the end of work area is obvious, or ends within a larger project's limits.
4. If the C18 (or C23) sign would follow within 600 m of a stationary C18, C23, or C11 "STATE HIGHWAY CONSTRUCTION NEXT _____ MILES", use a C9A sign for the first advance warning sign.
5. All cones used for night lane closures shall be fitted with reflective sleeves as specified in the specifications.
6. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime closures only.
7. Additional advance flaggers may be required. Flagger should stand in a conspicuous place, be visible to approaching traffic as well as approaching vehicles after the first vehicle has stopped. Nighttime flagger station shall be illuminated as provided in the current edition of the "Manual of Traffic Controls" published by the State of California, Department of Transportation. Place a minimum of four cones at 15 m intervals in advance of flagger station as shown.
8. Place C30 "LANE CLOSED" sign at 150 to 300 m intervals throughout extended work areas. They are optional if the work area is visible from the flagger station.
9. When a pilot car is used, place a C37 "TRAFFIC CONTROL-WAIT FOR PILOT CAR" sign at all intersections within traffic control area. Signs shall be clean and visible at all times.

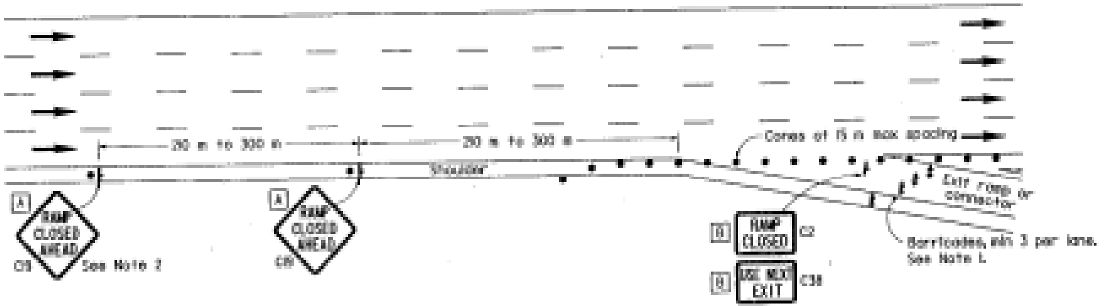
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON TWO LANE CONVENTIONAL HIGHWAYS

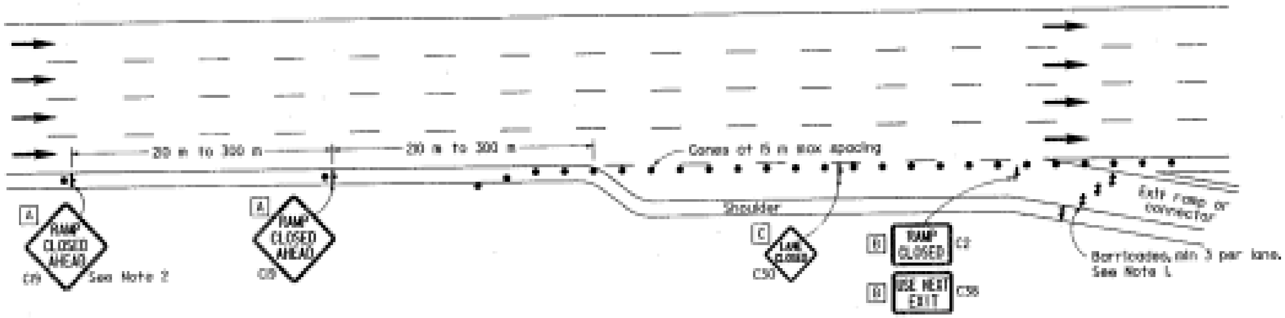
NO SCALE

T13

TYPICAL RAMP CLOSURES



EXIT RAMP OR CONNECTOR



EXIT RAMP OR CONNECTOR WITH ADDITIONAL LANE

NOTES

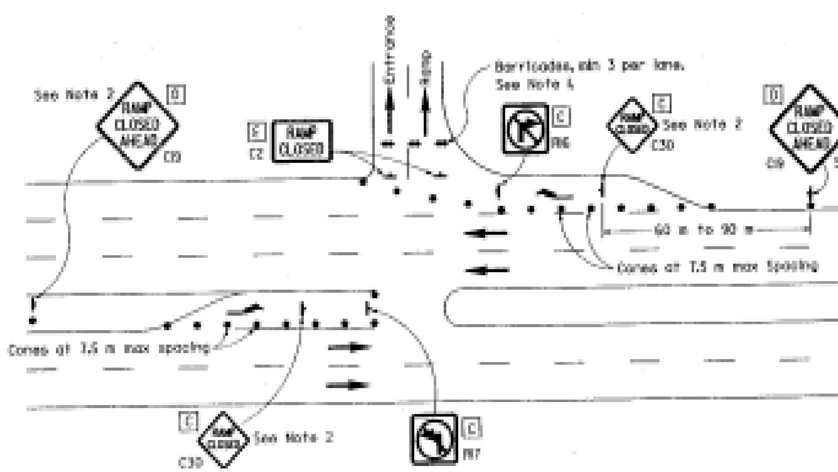
1. Barricades shall be Type I, II, or III for closures lasting one week or less and Type III for closures lasting longer than one week.
2. In lieu of placing the C19 "RAMP CLOSED AHEAD" and C30 "RAMP CLOSED" signs, black on orange overlay plates with the word "CLOSED" may be mounted, as directed by the Engineer, on all guide signs that refer to the closed ramp. The letter size on the overlay shall be the same as the guide sign.
3. All advance warning sign installations shall be equipped with flags for daytime closures.
4. All cones used for night lane closures shall be fitted with reflective sleeves as specified in the specifications.
5. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used in lieu of cones for daytime ramp closures only.
6. During nighttime ramp closures, at least one person shall be assigned full time for maintenance of traffic control devices.

LEGEND

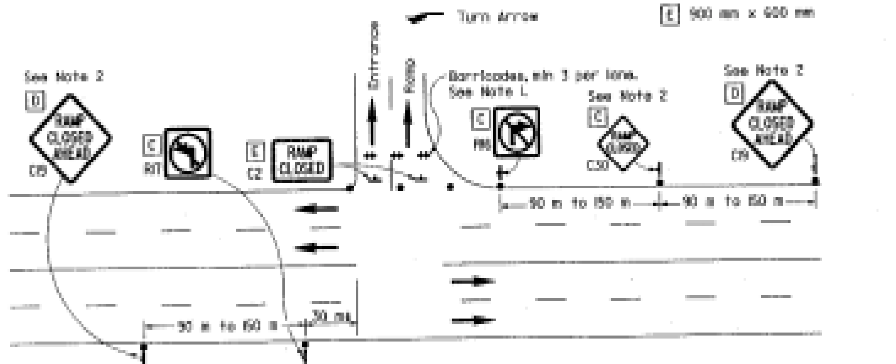
- Traffic Cone
- Sign
- Barricades
- Direction of Travel
- Turn Arrow

SIGN PANEL SIZE (Min)

- A 1200 mm x 1200 mm
- B 1200 mm x 750 mm
- C 750 mm x 750 mm
- D 900 mm x 900 mm
- E 900 mm x 600 mm



ENTRANCE RAMP WITH TURNING POCKETS



ENTRANCE RAMP WITHOUT TURNING POCKETS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR RAMP CLOSURE

NO SCALE

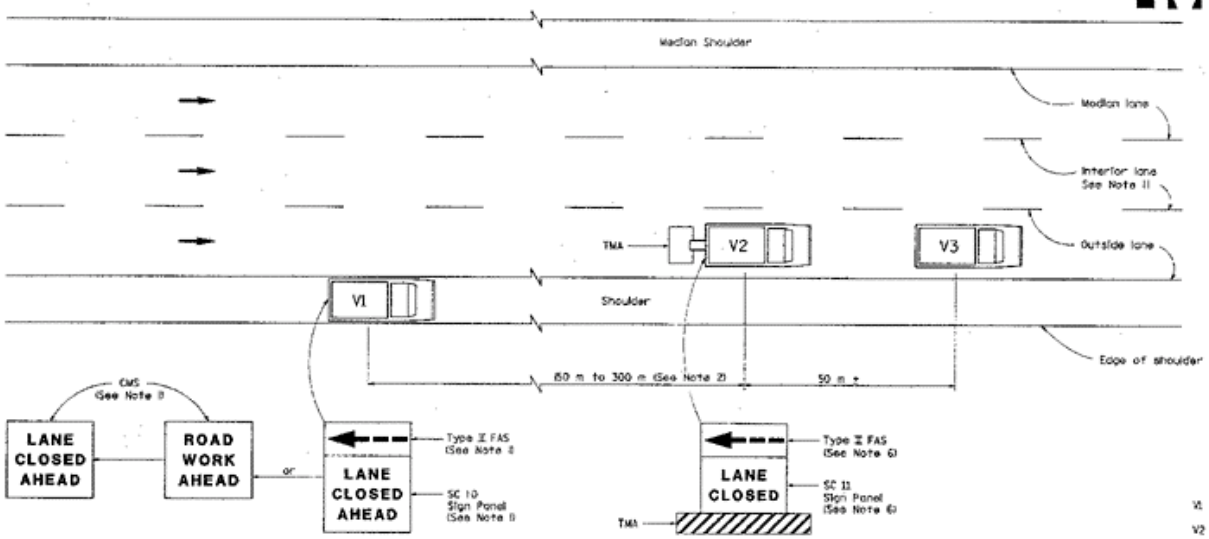
T14

Metric

DIST | COUNTY | ROUTE | KILOMETER POST TOTAL PROJECT | SHEET NO. | TOTAL SHEETS

REGISTERED CIVIL ENGINEER

July 1, 1997
PLANS APPROVAL DATE



MOVING LANE CLOSURE ON MEDIAN OR OUTSIDE LANE OF MULTILANE HIGHWAYS

LEGEND

V1	Sign Vehicle
V2	Shadow Vehicle
V3	Work/Application Vehicle
FAS	Flashing Arrow Sign
CMS	Changeable Message Sign
TMA	Truck-Mounted Attenuator
→	Direction of Travel

NOTES

1. Either the SC 10 sign panel shown or a changeable message sign shall be mounted on the rear of sign vehicle V1. A Type II flashing arrow sign shall be mounted on the rear of sign vehicle V1 and used with the SC 10 sign panel. A Type II flashing arrow sign will not be required with the changeable message sign provided the flashing arrow sign symbol may be displayed on the changeable message sign board. The changeable message sign shall be sequenced to show the "ROAD WORK AHEAD" message first, followed by the "LANE CLOSED AHEAD" message and then the flashing arrow sign symbol. For median lane closures, the flashing arrow sign symbol shall be reversed with the arrowhead on the right.
2. If traffic queues develop, sign vehicle V1 should be positioned upstream from the end of queue. Sign vehicle V1 shall be positioned where highly visible when shoulders are not available.
3. A minimum sight distance of 450 m should be provided in advance of sign vehicle V1.
4. Sign vehicle V1 should remain at the beginning of horizontal or vertical curves until the other vehicles (V2 and V3) are far enough beyond the curve to resume the minimum sight distance of 450 m.
5. Vehicle-mounted sign panels shall be Type III or IX reflective sheeting, black on white or black on orange with 150 mm minimum series D letters per Caltrans sign specifications.
6. Cross Vehicle Weight of shadow vehicle V2 shall be a minimum of 9000 kilograms and shall be equipped with a truck-mounted attenuator (TMA). The sign panel shown and a Type II flashing arrow sign shall be mounted on the rear of shadow vehicle V2. For median lane closure the flashing arrow sign symbol shall be reversed with the arrowhead on the right.
7. All vehicles used for lane closures shall be equipped with two-way radios and the vehicle operators shall maintain communication during the work or application operation.
8. All vehicles shall be equipped with flashing or rotating amber lights.
9. Where sufficient shoulder width is not available, sign vehicle V1 may encroach into the traffic lane staying as close to the edge of shoulder as practicable. When operating in this mode both V1 and V2 shall be equipped with a truck-mounted attenuator (TMA) and the Cross Vehicle Weight of V1 and V2 shall be a minimum of 9000 kilograms each.
10. Where workers would be on foot in the work area, a stationary type lane closure (Standard Plan T30, T14 etc., as applicable) shall be used instead of this plan.
11. For moving lane closure on interior lane of multilane highways, see Standard Plan T16.

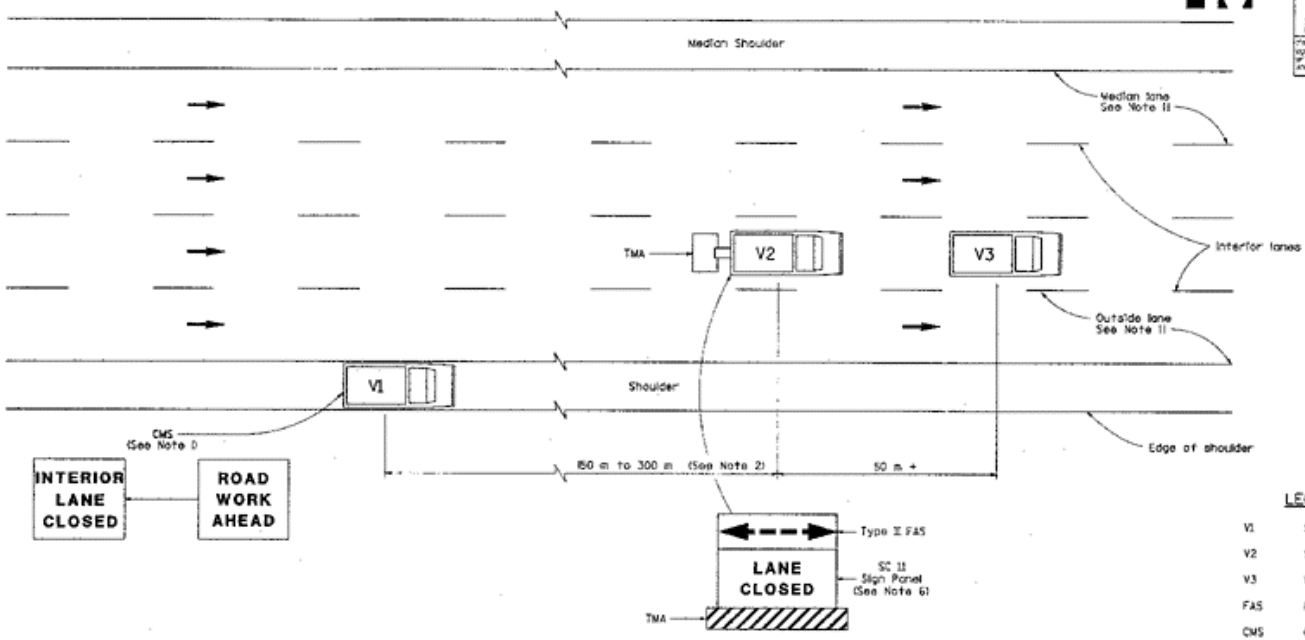
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR MOVING LANE CLOSURE ON MULTILANE HIGHWAYS

NO SCALE

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

T15



MOVING LANE CLOSURE ON INTERIOR LANE OF MULTILANE HIGHWAYS

LEGEND

V1	Sign Vehicle
V2	Shadow Vehicle
V3	Work/Application Vehicle
FAS	Flashing Arrow Sign
CMS	Changeable Message Sign
TMA	Truck-Mounted Attenuator
→	Direction of Travel

NOTES

1. A changeable message sign shall be mounted on the rear of sign vehicle V1. The changeable message sign shall be sequenced to show the "ROAD WORK AHEAD" message first, followed by the "INTERIOR LANE CLOSED" message. The message "CENTER LANE CLOSED" may be used in place of the "INTERIOR LANE CLOSED" message.
2. If traffic queues develop, sign vehicle V1 should be positioned upstream from the end of queue. Sign vehicle V1 shall be positioned where highly visible when shoulders are not available.
3. A minimum sight distance of 150 m should be provided in advance of sign vehicle V1.
4. Sign vehicle V1 should remain at the beginning of horizontal or vertical curves until the other vehicles (V2 and V3) are far enough beyond the curve to resume the minimum sight distance of 450 m.
5. Vehicle-mounted sign panels shall be Type III or IX reflective sheeting, black on white or black on orange with 150 mm minimum series D letters per Caltrans sign specifications.
6. Gross Vehicle Weight of shadow vehicle V2 shall be a minimum of 9000 kilograms and shall be equipped with a truck-mounted attenuator (TMA). The sign panel shown and a Type II flashing arrow sign shall be mounted on the rear of shadow vehicle V2. For median lane closure the flashing arrow sign symbol shall be reversed with the arrowhead on the right.
7. All vehicles used for lane closures shall be equipped with two-way radios and the vehicle operators shall maintain communication during the work or application operation.
8. All vehicles shall be equipped with flashing or rotating amber lights.
9. Where sufficient shoulder width is not available, sign vehicle V1 may encroach into the traffic lane staying as close to the edge of shoulder as practicable. When operating in this mode both V1 and V2 shall be equipped with a truck-mounted attenuator (TMA) and the Gross Vehicle Weight of V1 and V2 shall be a minimum of 9000 kilograms each.
10. Where workers would be on foot in the work area, a stationary type lane closure (Standard Plan T10, T11, etc., as applicable) shall be used instead of this plan.
11. For moving lane closure on median or outside lanes of multilane highways, see Standard Plan T15.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR MOVING LANE CLOSURE ON MULTILANE HIGHWAYS

NO SCALE

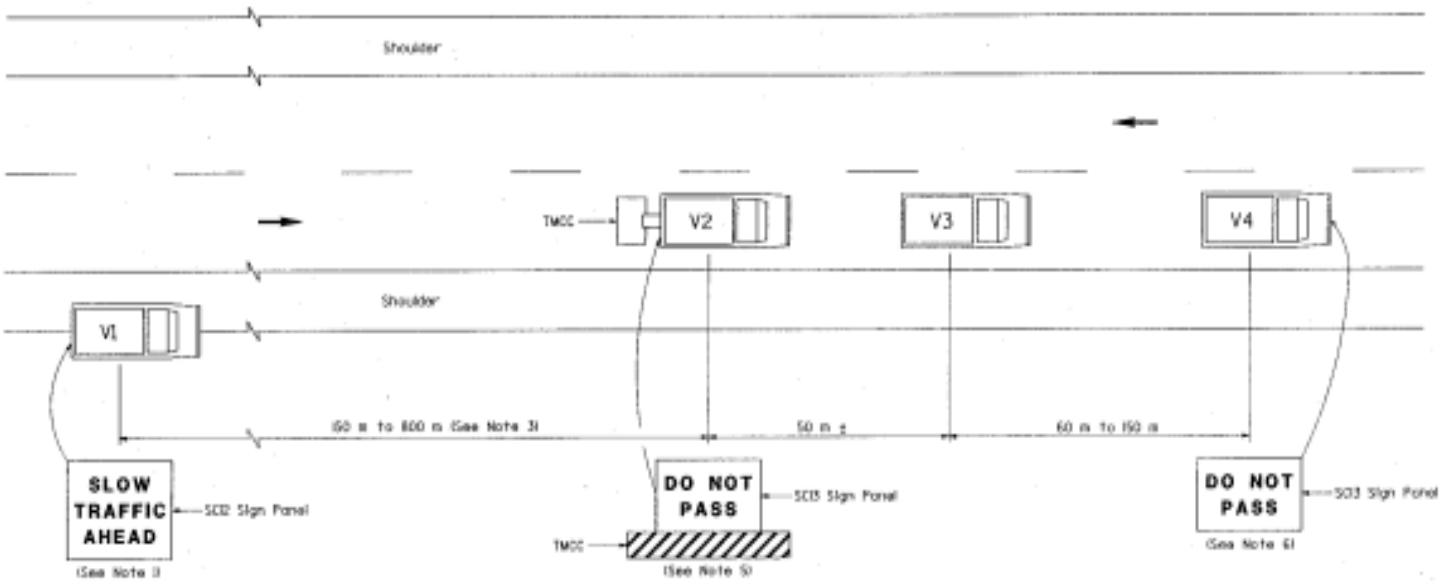
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

T16

1999 STD. PLAN T16

Caltrans Metric

July 1, 1997



LEGEND

V1	Sign Vehicle
V2	Shadow Vehicle
V3	Work/Application Vehicle
V4	Sign Vehicle
TMCC	Truck-Mounted Crash Cushion
→	Direction of Travel

NOTES

1. Either the sign panel shown or a changeable message sign which can display the "SLOW TRAFFIC AHEAD" message shall be mounted on the rear of sign vehicle V1.
2. Sign vehicle V1 should be positioned where highly visible when shoulders are not available.
3. If traffic queues develop, sign vehicle V1 should be positioned upstream from the end of queue.
4. Vehicle-mounted sign panels shall be Type III or IX reflective sheeting, black on white or black on orange with 150 mm minimum series D letters per Caltrans sign specifications.
5. Shadow vehicle V2 shall weigh between 5000 and 8000 kilograms and shall be equipped with a truck-mounted crash cushion. The sign panel shown shall be mounted on the rear of shadow vehicle V2. The message "LANE CLOSED" may be used in place of the "DO NOT PASS" message.
6. The sign panel shown shall be mounted on the front of sign vehicle V4, facing opposing traffic. The message "CAUTION" may be used in place of the "DO NOT PASS" message.
7. All vehicles shall be equipped with flashing or rotating amber lights.
8. Sign vehicle V4 will not be required when the work and vehicles V2 and V3 are 0.6 m or more from the centerline of the highway during the work or application operations.
9. All vehicles used for lane closures shall be equipped with two-way radios and the vehicle operators shall maintain communication during the work or application operation.
10. This plan shall not be used where workers would be on foot in the work area. Use a stationary type lane closure (Standard Plan T01) for this condition.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR MOVING LANE CLOSURE ON TWO LANE HIGHWAYS

NO SCALE

T17